

## A NOVEL NEURAL NETWORK FOR ASSOCIATIVE MEMORY VIA DYNAMICAL SYSTEMS

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(Communicated by Kok Lay Teo)

**ABSTRACT.** This paper proposes a novel neural network model for associative memory using dynamical systems. The proposed model is based on synthesizing the external input vector, which is different from the conventional approach where the design is based on synthesizing the connection matrix. It is shown that this new neural network (a) stores the desired prototype patterns as asymptotically stable equilibrium points, (b) has no spurious states, and (c) has learning and forgetting capabilities. Moreover, new learning and forgetting algorithms are also developed via a novel operation on the matrix space. Numerical examples are presented to illustrate the effectiveness of the proposed neural network for associative memory. Indeed, results of simulation experiments demonstrate that the neural network is effective and can be implemented easily.

**1. Introduction.** Associative memory refers to the fundamental feature of human brain that information can be stored and later recalled by association with other "similar" information. Although the neurobiological mechanism of associative memory is rather complex and has not been completely exploited, realization of associative memory may be possible artificially. Indeed, an important feature of artificial neural networks is to implement the information storage and retrieval as associative memories. Associative learning and retrieval of information in parallel

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2000 *Mathematics Subject Classification.* 92B20, 37C75, 68T05.

*Key words and phrases.* Neural network, associative memory, prototype pattern, spurious state, asymptotic stability, learning and forgetting algorithm.